

What is claimed is:

1. A method of making a photocatalyst by loading titanium dioxide film on a flexible substrate, comprising the steps of:

5 (1)Preparing an active layer sol-gel by:

a) Making a precursor solution comprising n-butyl titanate, ethanol, diethanolamine, and water in the volume ratio of n-butyl titanate : ethanol : diethanolamine : water = 1:8-12:0.1-0.15:0.05-0.06;

10 b) Adding a pore-forming agent selected from the group consisting of polyglycol, octadecylamine, and mixtures thereof to the precursor solution of step (1) a), wherein the mass ratio of the amount of the pore-forming agent to the amount of the ethanol in the precursor solution is pore-forming agent : ethanol = 1%-30% : 1; and

15 c) Placing the resulting solution in a sealed gelatinization process for at least 3 days; and

(2)Preparing an active TiO₂ photocatalyst layer by:

20 a) Coating a flexible substrate with the active layer sol-gel prepared according to step (1) using a pulling and coating method;

b) Drying the coated flexible substrate; and

25 c) Placing the coated, dried flexible substrate in a hydrothermal kettle for thermal crystallization in a mixed solvent of ethanol and water at 60-200°C.

2. A method of making a photocatalyst by loading titanium dioxide film on a flexible substrate, comprising the steps of:

(1)Preparing an active layer sol-gel by:

- 5 a) Making a precursor solution comprising titanium tetrachloride, ethanol, and water in the volume ratio of titanium tetrachloride : ethanol : water = 1:8-12:0.08-0.15;
- 10 b) Adding a pore-forming agent selected from the group consisting of polyglycol, octadecylamine, and mixtures thereof to the precursor solution of step a), wherein the mass ratio of the amount of the pore-forming agent to the amount of the ethanol in the precursor solution is pore-forming agent : ethanol = 1%-30% : 1; and
- 15 c) Placing the resulting solution in a sealed gelatinization process for at least 3 days; and

(2)Preparing an active TiO_2 photocatalyst layer by:

- 20 a) Coating a flexible substrate with the active layer sol-gel prepared according to step (1) using a pulling and coating method;
- b) Drying the coated flexible substrate; and
- c) Placing the coated, dried flexible substrate in a hydrothermal kettle for thermal crystallization in a mixed solvent of ethanol and water at 60-200°C.

25 3. The method according to claim 1 or 2, wherein in the step of

preparing said active layer sol-gel further comprises adding an additional agent selected from the group consisting of lanthanum nitrate, n-butyl silicate, and mixtures thereof, to the precursor solution.

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4. The method according to claim 3, wherein the molar ratio of lanthanum to titanium is from 0% to about 5%.

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5. The method according to claim 4, wherein the molar ratio of lanthanum to titanium is from about 0.8% to about 1.2%.

6. The method according to claim 3, wherein the molar ratio of silica to titanium is from 0% to about 40%.

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7. The method according to claim 6, wherein the molar ratio of silica to titanium is from about 15% to about 25%.

8. The method according to any of claims 1-7 wherein the ratio of said pore-forming agent to ethanol is from about 8% to about 15%.

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9. The method according to any of claims 1-7 wherein said flexible substrate is selected from the group consisting of non-woven fabrics, woven fabrics, dust-free papers, water-pricked non-woven fabrics having strong surface hydrophilic property, and mixtures thereof.

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10. The method according to any of claims 1-7 further comprising the step of removing excess sol-gel by spinning or extrusion, after the step of coating the flexible substrate with the active layer sol-gel prepared according to step (1).

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11. The method according to any of claims 1-7 wherein step of drying the coated flexible substrate is carried out at a temperature of from about 30°C to about 150°C.

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12. The method according to claim 11 wherein said drying temperature is from about 80°C to about 120°C.

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13. The method according to any of claims 1-7 wherein the ratio of ethanol to water in the mixed solvent of ethanol and water used in the thermal crystallization step is from 0% to about 80%.

14. The method according to claim 13 wherein the ratio of ethanol to water is from 0% to about 20%.

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15. The method according to any of claims 1-7 wherein said thermal crystallization is carried out at a temperature of from about 120°C to about 140°C.

16. A photocatalyst prepared by the method according to any one of claims 1-15.